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(54) **FLOW-INDUCING BAFFLE FOR ENGINE COMPARTMENT VENTILATION**

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F01P 7/02 (2006.01)

(52) **U.S. Cl.** **180/68.1**; 123/41.49

(58) **Field of Classification Search** 180/68.1, 180/68.2; 123/41.49
See application file for complete search history.

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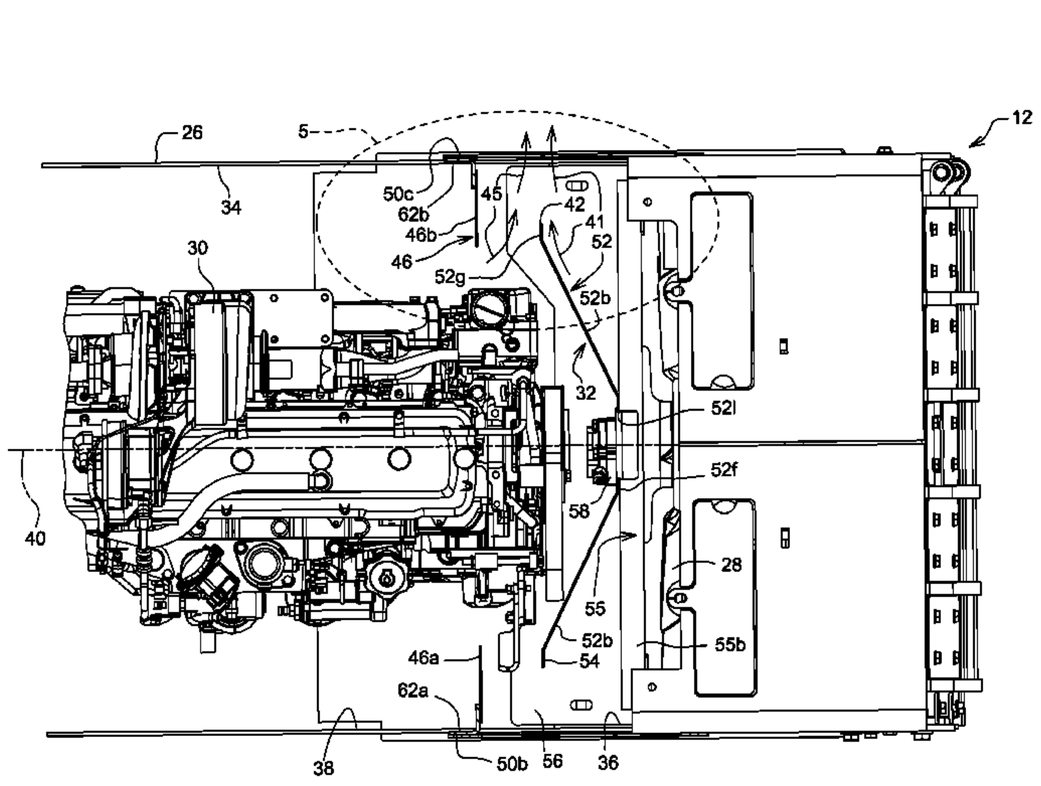
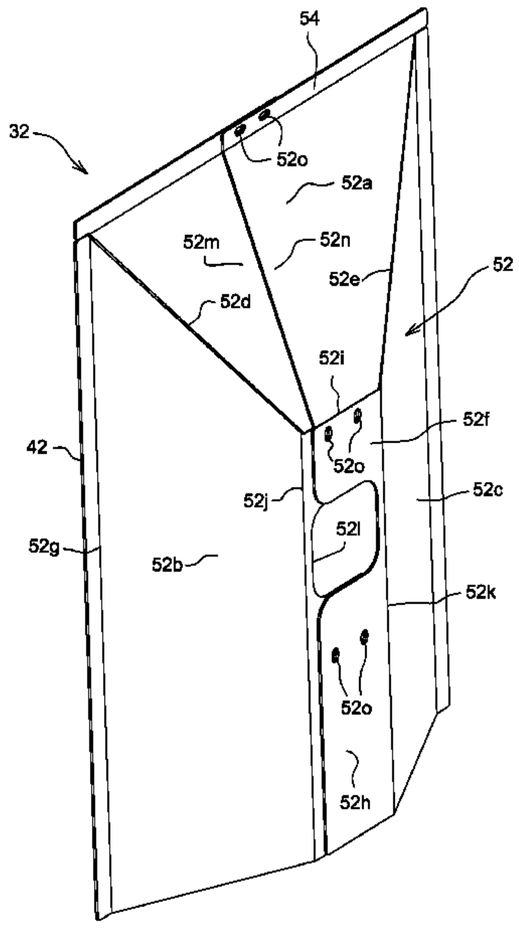
Primary Examiner — John R Olszewski
Assistant Examiner — Jacob Meyer

(57) **ABSTRACT**

A work machine comprises a baffle configured to divert air flow from a source of pressurized air laterally outwardly toward a peripheral edge of the baffle to create a flow-inducing region about the peripheral edge to ventilate the engine compartment.

7 Claims, 9 Drawing Sheets





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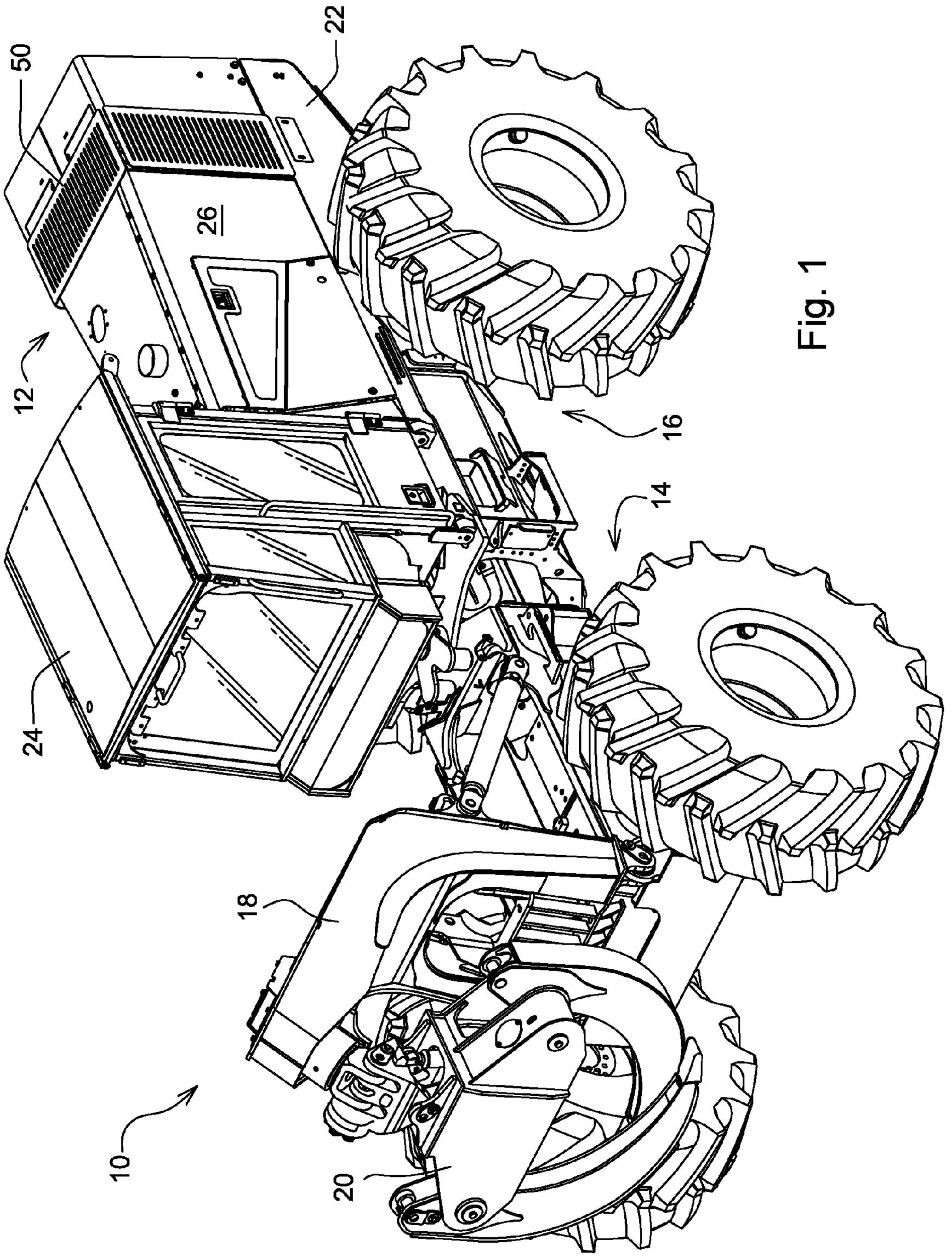
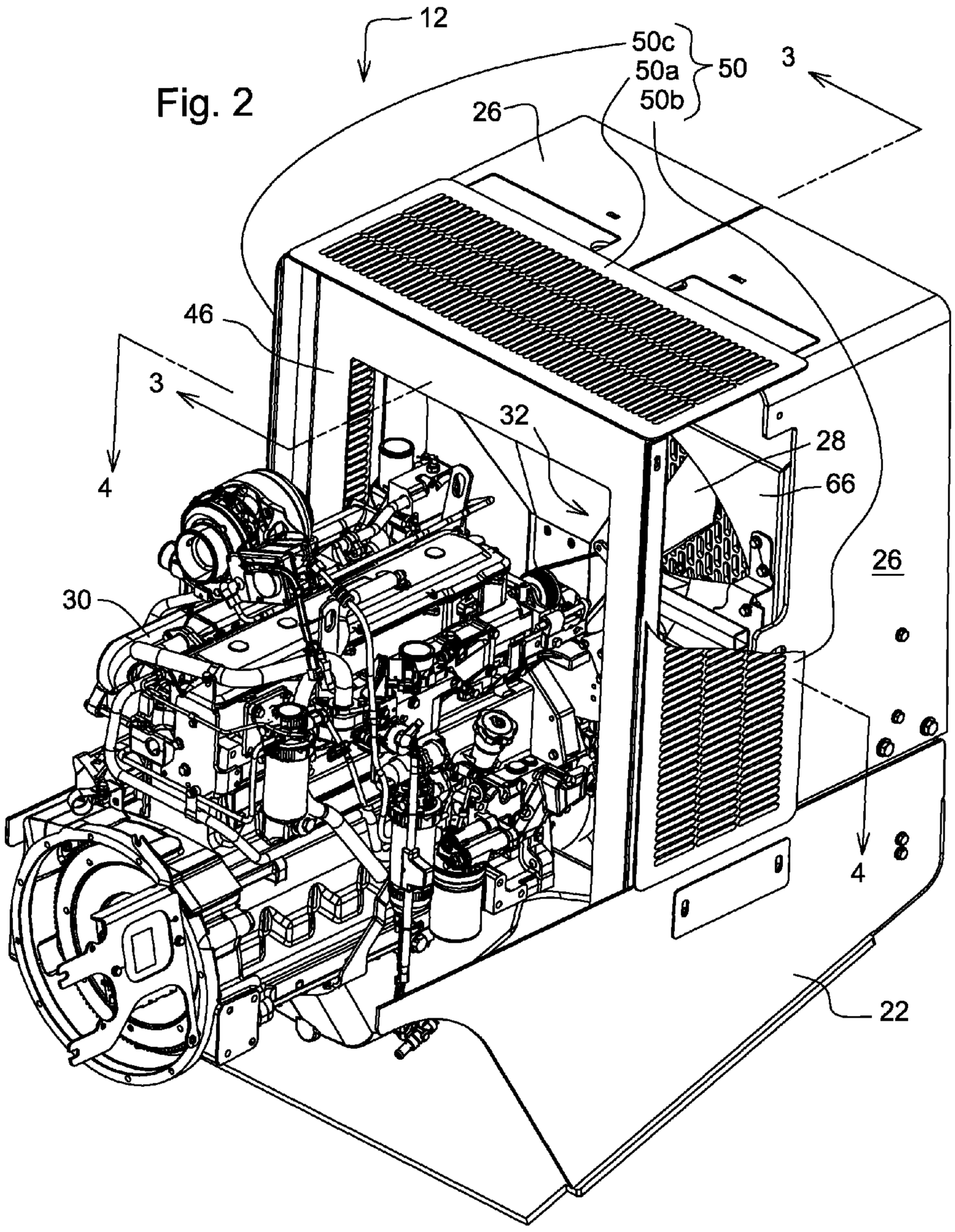
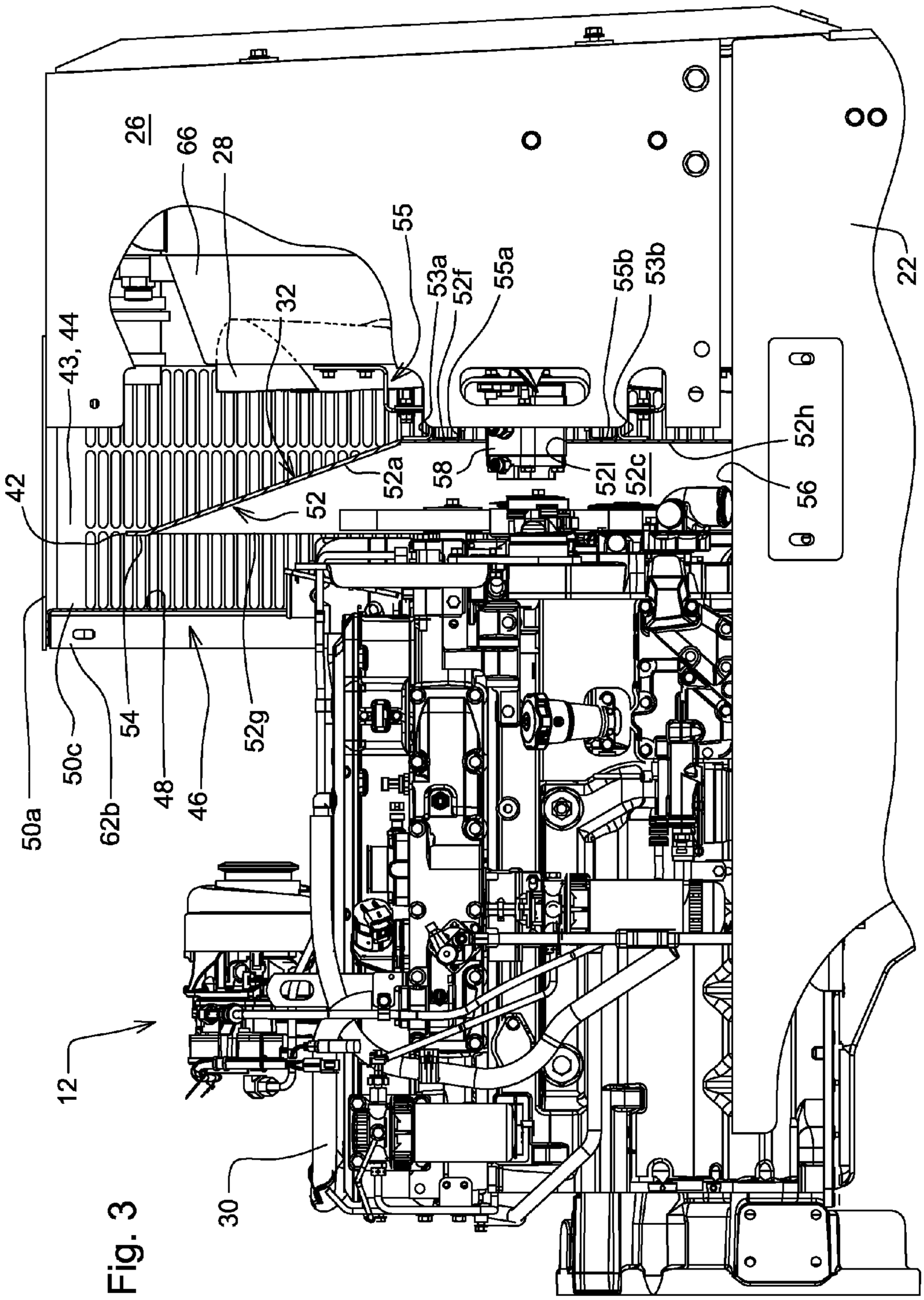


Fig. 1

Fig. 2

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52f
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55b
53b
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58
52l
52c
52
42
50c
54
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52g
50a
62b
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Fig. 3

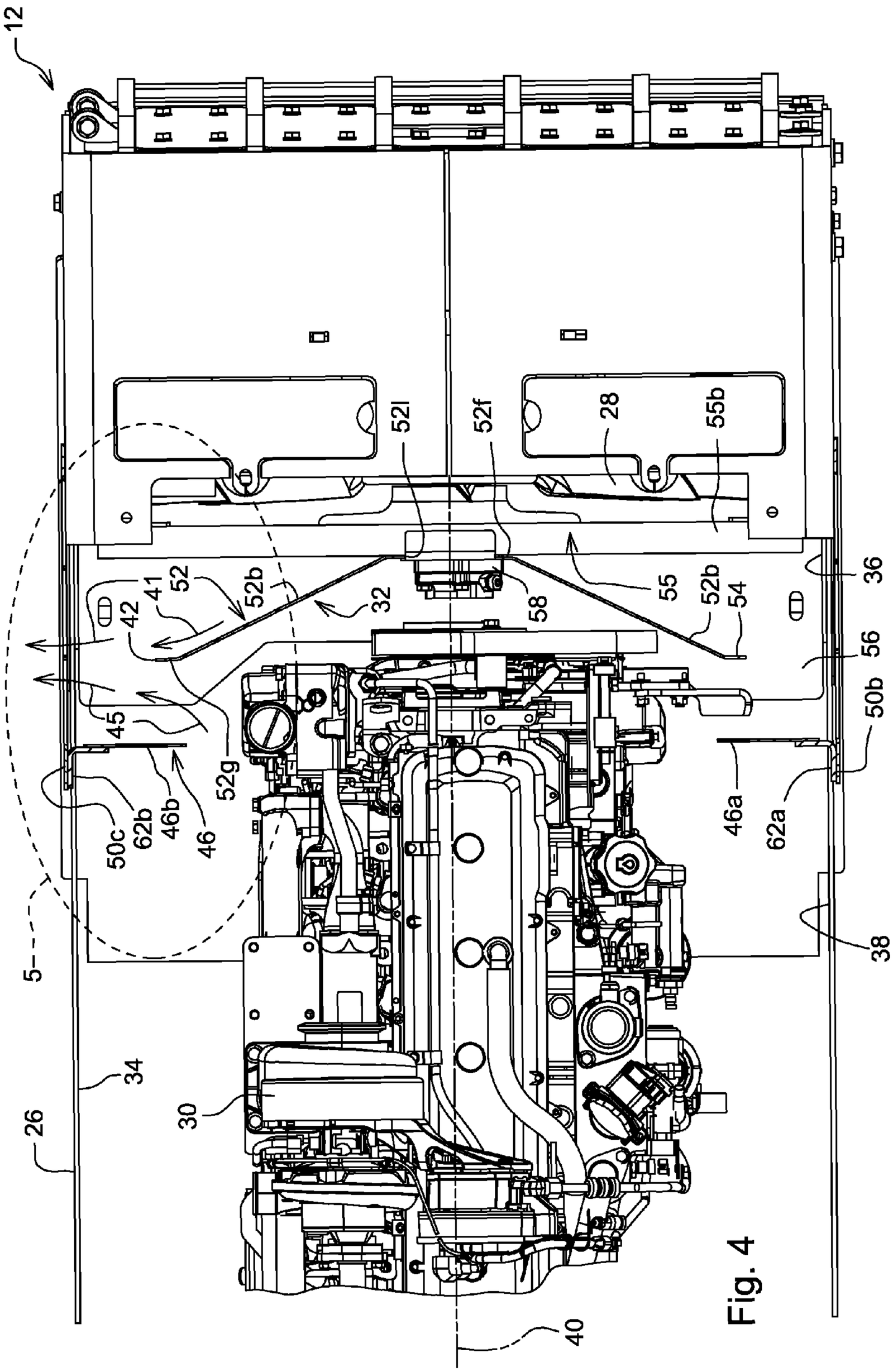
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Fig. 4

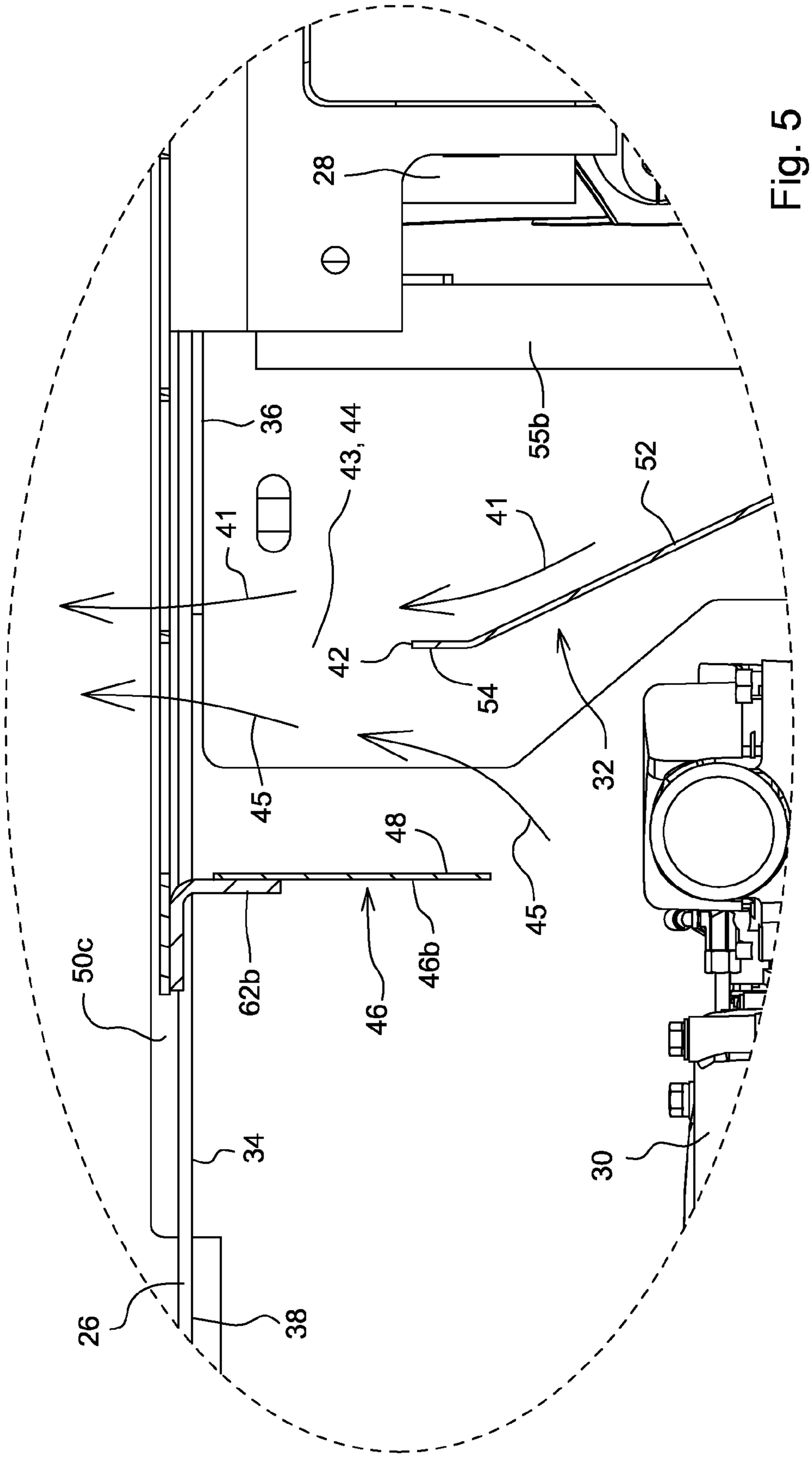

Fig. 5

Fig. 6

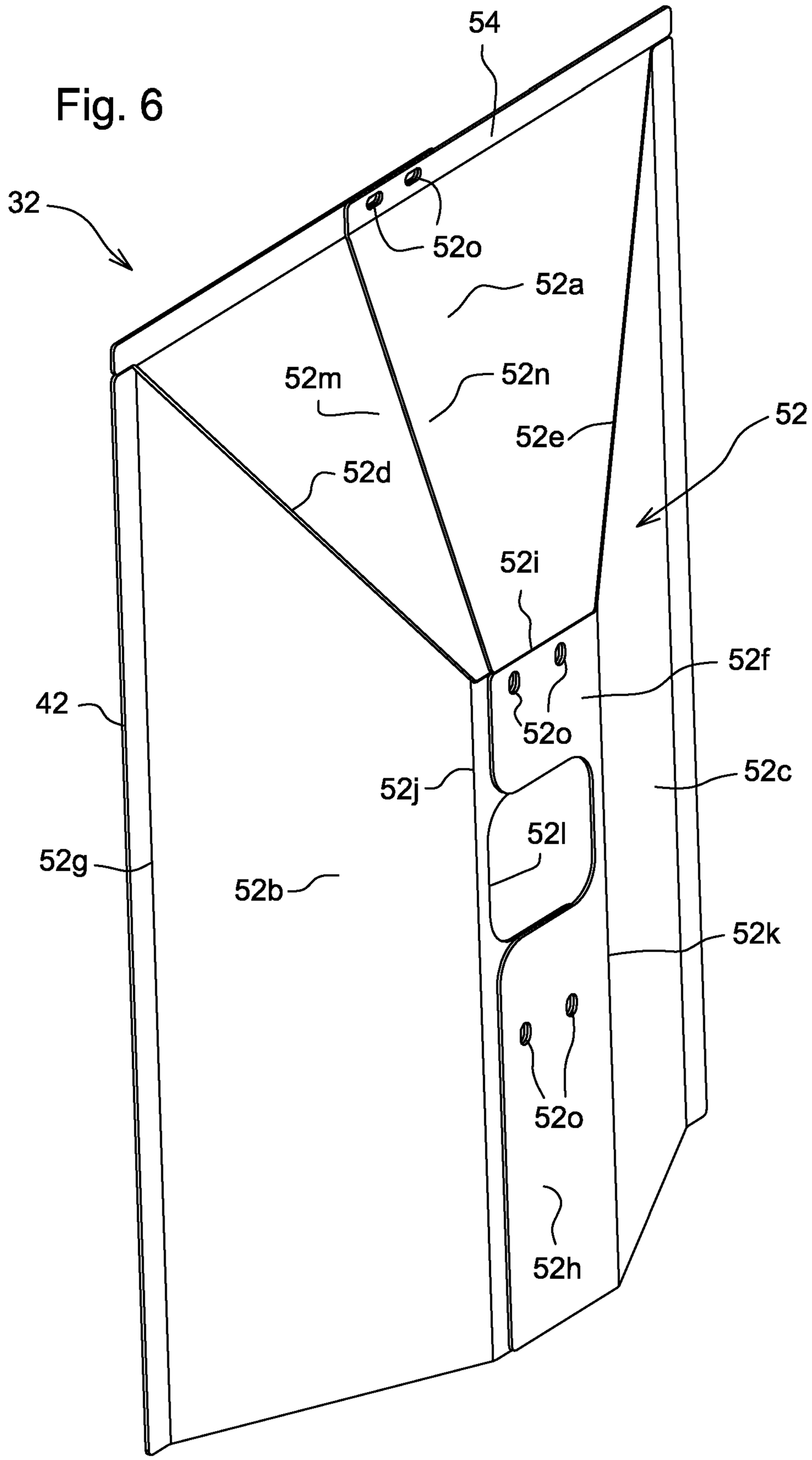
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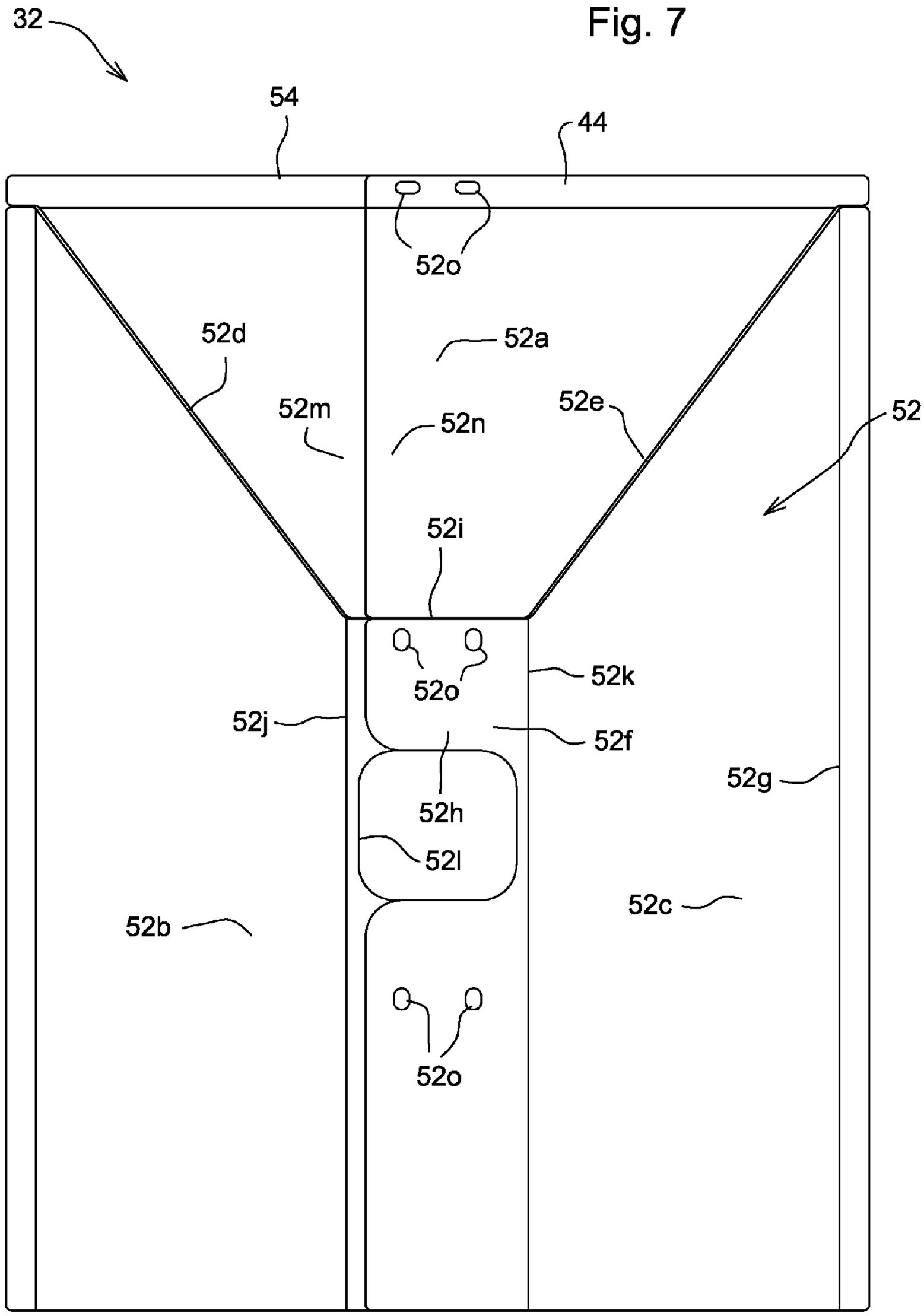
Fig. 7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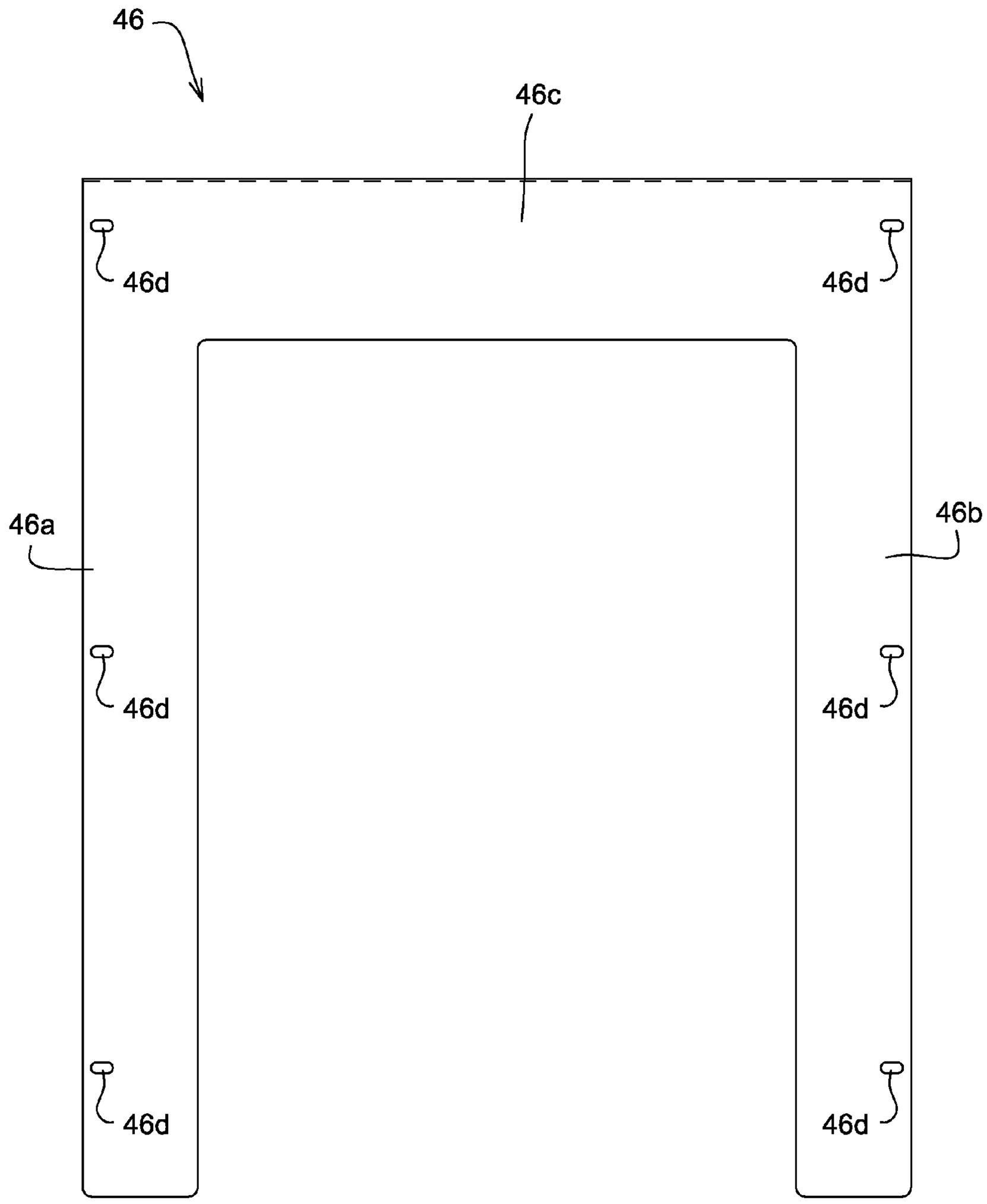

Fig. 8

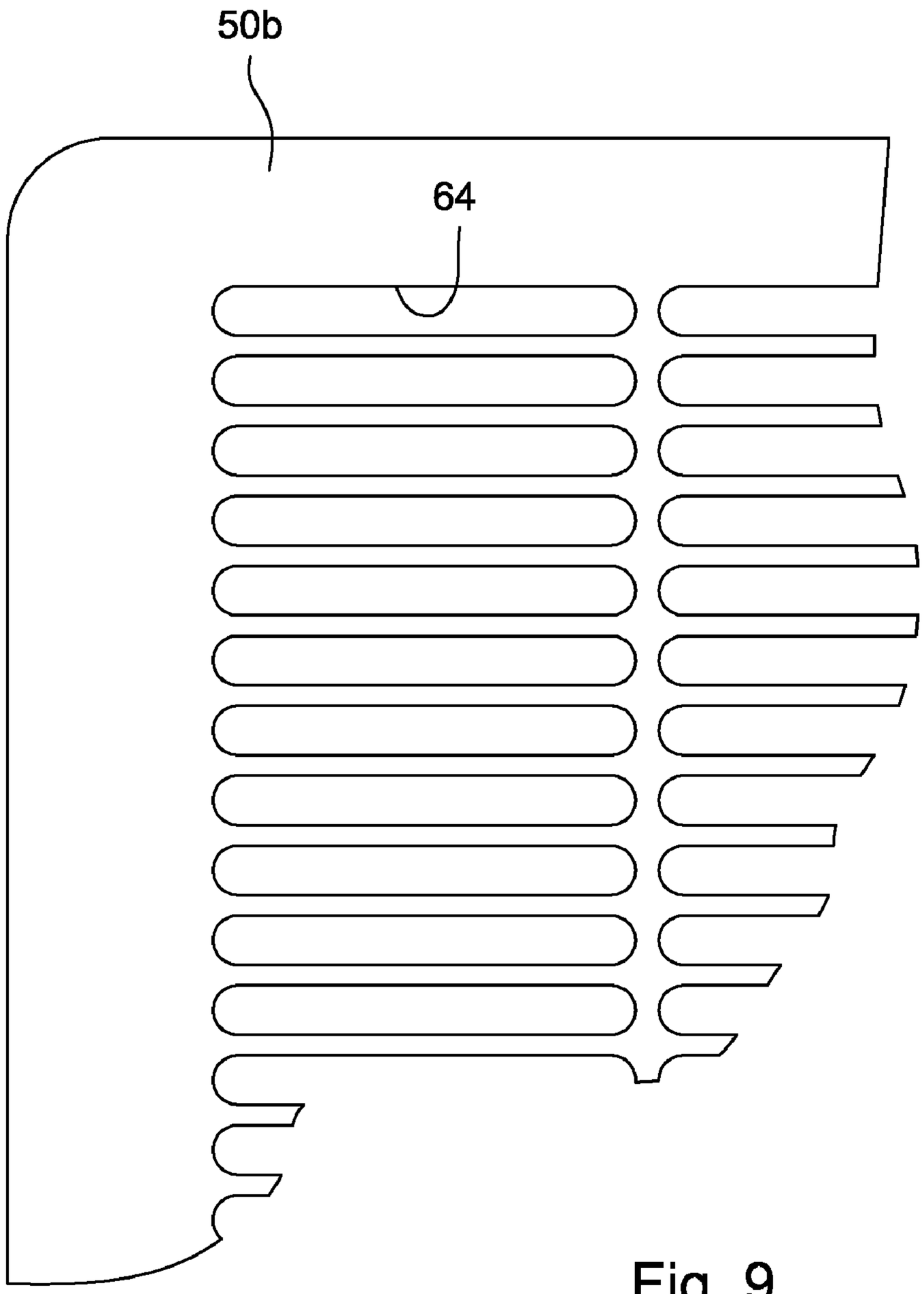

Fig. 9

FLOW-INDUCING BAFFLE FOR ENGINE COMPARTMENT VENTILATION

FIELD OF THE DISCLOSURE

The present disclosure relates to engine compartment ventilation.

BACKGROUND OF THE DISCLOSURE

The engine of a work machine is typically located in an engine compartment. Engine operation may heat the engine compartment, such as by radiant and convective heat transfer from the engine. Excessively high engine compartment temperatures could put electronic or polymer components at risk for damage.

In a conventional sucker cooling system, the cooling fan discharges heated air from the heat exchangers into the engine compartment, adding to the heat in the engine compartment. One existing method of reducing engine compartment temperatures with a conventional sucker cooling system is to place a wall or baffle between the engine and cooling package that completely seals off the two spaces.

SUMMARY OF THE DISCLOSURE

According to the present disclosure, there is provided a work machine comprising a baffle configured to divert air flow from a source of pressurized air laterally outwardly toward a peripheral edge of the baffle to create a flow-inducing region about the peripheral edge to ventilate an engine compartment of the work machine. Exemplarily, the baffle is positioned between the source of pressurized air and the engine compartment, and the baffle flares laterally outwardly relative to an axis as the baffle extends along the axis away from the source of pressurized air toward the engine compartment so as to divert air flow from the source of pressurized air laterally outwardly toward the peripheral edge of the baffle to create the flow-inducing region, about the peripheral edge and in fluid communication with the engine compartment, that ventilates the engine compartment.

The baffle may be positioned within a housing between the source of pressurized air and the engine. The baffle thus partitions an interior region of the housing into a cooling compartment in which the source of pressurized air is positioned and the engine compartment in which an engine is positioned.

The baffle may comprise a main body in the form of a frusto-pyramidal section and a lip flared laterally outwardly relative to the main body as the lip extends from the main body to the peripheral edge. As such, the main body may comprise an isosceles trapezoid top panel, a non-isosceles trapezoid first side panel, and a non-isoceles trapezoid second side panel opposite the first side panel, the top panel and the first side panel meet along a first edge, and the top panel and the second side panel meet along a second edge.

The work machine may further comprise a second baffle located in the engine compartment. In such a case, the two baffles may be arranged so as to cooperate to define therebetween a ventilation passageway leading from the engine compartment to a peripheral space between the peripheral edge and the housing for discharge of the engine compartment air flow from the engine compartment through a ventilation outlet of the housing.

The above and other features will become apparent from the following description and the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description of the drawings refers to the accompanying figures in which:

FIG. **1** is a perspective view of a work machine in the form of, for example, a log skidder;

FIG. **2** is a fragmentary perspective view of a front section of the work machine;

FIG. **3** is a sectional view taken along lines **3-3** of FIG. **2**;

FIG. **4** is a sectional view taken along lines **4-4** of FIG. **2**;

FIG. **5** is an enlarged view of region **5** of FIG. **4**;

FIG. **6** is a front perspective view of a flow-inducing baffle of the work machine;

FIG. **7** is a front elevation view of the flow-inducing baffle;

FIG. **8** is a front elevation view of another baffle of the work machine; and

FIG. **9** is an elevation view of a portion of a ventilation outlet in the form of a screen.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. **1**, an exemplary work machine **10** has an engine-and-cooling unit **12**. Illustratively, the work machine **10** is a log skidder, although it could be any of a variety of work machines.

In the case of a skidder, the machine **10** has rear and front sections **14**, **16** articulated to one another. The rear section **14** has an arch **18** pivotable to raise and lower an attachment **20** (e.g., grapple or cable) for gripping the tree. The front section **16** has the engine-and-cooling unit **12** mounted on a frame **22** in front of the operator's station **24**.

Referring to FIGS. **2-5**, the engine-and-cooling unit has a housing **26**, a source of pressurized air **28** (e.g., a fan such as an axial fan), an engine **30**, and a flow-inducing, first baffle **32**. The baffle **32** is positioned within the housing **26** between the source of pressurized air **28** and the engine **30** so as to partition an interior region **34** of the housing **26** into a cooling compartment **36** in which the source of pressurized air **28** is positioned and an engine compartment **38** in which the engine **30** is positioned. As shown best in FIG. **4**, the baffle **32** flares laterally outwardly relative to an axis **40** as the baffle **32** extends along the axis **40** away from the source of pressurized air **28** toward the engine compartment **38** so as to divert air flow **41** from the source of pressurized air **28** laterally outwardly toward a peripheral edge **42** of the baffle **32** to create a flow-inducing region **43**, in a peripheral space **44** between the peripheral edge **42** and the housing **26** and in fluid communication with the engine compartment **38**, that induces an engine compartment air flow **45** so as to ventilate the engine compartment **38**.

A second baffle **46** is positioned in the engine compartment **38**. The baffles **32**, **46** cooperate to define therebetween a ventilation passageway **48** leading from the engine compartment **38** to the peripheral space **44**. The ventilation passageway **48** conducts the engine compartment air flow **45** from the engine compartment **38** to the peripheral space **44** for discharge from the interior region **34** through a ventilation outlet **50** of the housing **26**.

Referring to FIGS. **6** and **7**, the first baffle **32** has a main body **52** and a lip **54** disposed about at least part of the main body **52**. The main body **52** has the form of, for example, a frusto-pyramidal section (e.g., a rectangular frusto-pyramidal section). Exemplarily, the main body **52** comprises an isosceles trapezoid top panel **52***a*, a non-isosceles trapezoid first side panel **52***b*, and a non-isoceles trapezoid second side panel **52***c* opposite the first side panel **52***b*. The top panel **52***a* and the first side panel meet **52***b* along a first edge **52***d*. The

top panel **52***a* and the second side panel **52***c* meet along a second edge **52***e*. The first and second side panels **52***b*, **52***c* are upright on a platform **56** of the housing **26**, and support the top panel **52***a* above platform **56**.

The main body **52** further has a basal, first end **52***f* and a second end **52***g* opposite to and narrower than the first end **52***f*. An end panel **52***h* positioned at the first end **52***f* is connected to the top and side panels **52***a*, **52***b*, **52***c* such that the end panel **52***h* meets the top panel **52***a* along a third edge **52***i*, meets the first side panel **52***b* along a fourth edge **52***j*, and meets the second side panel **52***c* along a fifth edge **52***k*. A hole **52***l* is formed in the end panel **52***h*, and a hydraulic motor **58** (FIGS. **3** and **4**) is mounted in the hole **52***l* and operably connected to the source of pressurized air **28** (e.g., an axial cooling fan or other cooling fan) for operation thereof. In other examples, the source of pressurized air **28** may be driven directly by a pulley rotated by the engine, instead of hydraulically driven.

The lip **54** is connected to the basal end **52***f* such that it flares laterally outwardly therefrom to the peripheral edge **42** so as to include the peripheral edge **42**. More particularly, the lip **54** is flared laterally outwardly from, and extends about, the top panel **52***a* and the first and second side panels **52***b*, **52***c*.

The baffle **32** may have two members or halves **52***m*, **52***n* that cooperate to provide the baffle **32** and its shape. The two members **52***m*, **52***n* may be configured as two formed sheets which overlap in a middle area of the baffle **32** and are fastened together by fasteners that extend through respective fastener-receiving holes **52***o* formed in the portions of the members **52***m*, **52***n* that provide the end panel **52***h* and lip **54**. The members **52***m*, **52***n* overlap as such to prevent or otherwise inhibit leakage between the members **52***m*, **52***n*. Fabricating the baffle **32** out of the two members **52***m*, **52***n*, rather than just a single formed piece, facilitates servicing this portion of the skidder or other work machine **10**.

Referring to FIG. **3**, the baffle **32** is mounted to the housing **26**. The fasteners extending through fastener-receiving holes **52***o* attach the end panel **52***h* to upper and lower mounting brackets (e.g., angles) **53***a*, **53***b* or other baffle mount. The brackets **53***a*, **53***b* are, in turn, fixed to horizontal bars **55***a*, **55***b* of a mounting structure, such as, for example, an H-frame **55**, anchored to the housing **26**. In the case where the source **28** is a cooling fan, the fan shroud **66** of such fan may also be fixed to the mounting structure, or H-frame **55**, so as to be mounted to the housing **26** as well.

Referring to FIGS. **3**, **5**, and **8**, the baffle **46** extends laterally inwardly from the housing **26**. The housing **26** has the outlet **50** which may be configured, for example, as a number of screens, such as screens **50***a*, **50***b*, **50***c*, mounted along the top and two sides of the unit **12**. The baffle **46** may be inverted U-shaped and configured as a plate with such a shape. In such a case, the baffle **46** may have a pair of legs **46***a*, **46***b* and a cross member **46***c* spanning between and connecting the legs **46***a*, **46***b* at the tops thereof.

The baffle **46** may be connected to the frame **22** in a variety of ways. For example, the legs **46***a*, **46***b* may be connected to mounting brackets **62***a*, **62***b* (e.g., angle bars) via fasteners extending through fastener-receiving holes **46***d* formed in the legs **46***a*, **46***b*, and the brackets **62***a*, **62***b* may be anchored to the frame **22** to fix the baffle **46** in place. In other examples, there may be one or more other mounting brackets, in place of or in addition to the brackets **62***a*, **62***b*, positioned in similar or other locations about the baffle **46** to anchor the baffle **46** to the frame **22** or to the housing **26**.

Referring to FIG. **9**, there is shown a portion of the outlet **50**, in particular, a portion of one of the screens **50***a*, **50***b*, **50***c*, such as screen **50***c*. Each screen **50***a*, **50***b*, **50***c* may have elongated slots **64** or other openings formed therein. Exemplarily, each screen **50***a*, **50***b*, **50***c* has three columns of elongated slots **64**. The obstructed portion of each screen **50***a*, **50***b*, **50***c*, and thus the outlet **50**, helps to prevent ingress of debris and other prohibited items from entering the unit **12**, whereas the screens **50***a*, **50***b*, **50***c*, and thus the outlet **50**, are configured so as to be sufficiently open to facilitate induction of the engine compartment air flow **45** through the screens **50***a*, **50***b*, **50***c*. The percentage opening of each screen **50***a*, **50***b*, **50***c* may be, for example, 73% or thereabouts. The percentage opening may be greater than 73% and possibly even somewhat less than 73%. In testing, a percentage opening of 58% has been found to be too restrictive. To provide such percentage opening, the screens **50***a*, **50***b*, **50***c* may have a number (e.g., three columns) of elongated slots **64** or other opening(s).

In operation, the source of pressurized air **28** draws ambient air into the cooling compartment **36** and passed a number heat exchangers mounted therein (e.g., charge-air cooler, radiator, transmission oil cooler, hydraulic oil cooler, and/or air conditioning condenser). The source **28** pressurizes the air and advances it toward the baffle **32**. The baffle **32** diverts such air flow **41** from the source of pressurized air **28** laterally outwardly relative to the axis **40** along the front side of the panels **52***a*, **52***b*, **52***c* and the lip **54** toward the peripheral edge **42** thereof. The main body **52** and the lip **54** thus accelerate the air flow **41** along the front side of the baffle **32** to create the flow-inducing region **43** in the peripheral space **44** between the peripheral edge **42** and the housing **26** and in fluid communication with the engine compartment **38**. The platform **56** acts as a barrier that prevents or otherwise inhibits the air flow **41** from passing underneath the baffle **32** so that the air flow **41** is forced into the flow-inducing region **43**. The flow-inducing region **43** induces the engine compartment air flow **45** so that the flow **45** advances out of the engine compartment **38** through the ventilation passageway **48**, the peripheral space **44**, and the screens **50***a*, **50***b*, and **50***c* of the outlet **50** to the exterior of the unit **12** so as to ventilate the engine compartment **38**, thereby keeping the temperature within the engine compartment at acceptable levels.

Such flow-induction occurs possibly by a venturi effect and/or entrainment. It is believed that a role of the lip **54** is to accelerate the air flow **41** slightly, in addition to the acceleration provided by the main body **52**, as it enters the flow-inducing region **43** to help create a weak venturi effect and/or to provide higher-velocity air and therefore a larger velocity gradient in the flow-inducing region **43** to entrain more engine compartment air flow **45**.

While the disclosure has been illustrated and described in detail in the drawings and foregoing description, such illustration and description is to be considered as exemplary and not restrictive in character, it being understood that illustrative embodiments have been shown and described and that all changes and modifications that come within the spirit of the disclosure are desired to be protected. It will be noted that alternative embodiments of the present disclosure may not include all of the features described yet still benefit from at least some of the advantages of such features. Those of ordinary skill in the art may readily devise their own implementations that incorporate one or more of the features of the present disclosure and fall within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A work machine, comprising:

a housing,

a source of pressurized air,

an engine,

a baffle positioned within the housing between the source of pressurized air and the engine so as to partition an interior region of the housing into a cooling compartment in which the source of pressurized air is positioned and an engine compartment in which the engine is positioned, wherein the baffle flares laterally outwardly relative to an axis as the baffle extends along the axis away from the source of pressurized air toward the engine compartment so as to divert air flow from the source of pressurized air laterally outwardly toward a peripheral edge of the baffle to create a flow-inducing region, in a peripheral space between the peripheral edge and the housing and in fluid communication with the engine compartment, that ventilates the engine compartment, the baffle including a main body in the form of a frusto-pyramidal section and a lip, the main body including a basal, first end and a second end opposite to and narrower than the first end, the lip flared outwardly from the second end of the main body to the peripheral edge.

2. The work machine of claim **1**, wherein the main body comprises an isosceles trapezoid top panel, a non-isosceles trapezoid first side panel, and a non-isosceles trapezoid second side panel opposite the first side panel, the top panel and the first side panel meet along a first edge, and the top panel and the second side panel meet along a second edge.

3. The work machine of claim **2**, wherein the lip is flared laterally outwardly from, and extends about, the top panel and the first and second side panels.

4. The work machine of claim **2**, wherein the main body comprises an end panel at the second end of the baffle, the end panel and the top panel meet along a third edge, the end panel and the first side panel meet along a fourth edge, and the end panel and the second side panel meet along a fifth edge.

5. The work machine of claim **1**, comprising a second baffle positioned in the engine compartment, the baffle and the second baffle cooperate to define therebetween a ventilation passageway leading from the engine compartment to the peripheral space, and the second baffle is inverted U-shaped.

6. The work machine of claim **2**, wherein the housing comprises a platform, and the first and second side panels are upright on, and support the top panel above, the platform.

7. The work machine of claim **1**, comprising a hydraulic motor, wherein the source of pressurized air is a cooling fan, and the hydraulic motor is operably connected to the cooling fan and is mounted in a hole formed in the second end of the baffle.

* * * * *